

locality and their appearance, these Sea-lions must be referred to the species of the Auckland Islands, upon which Mr. J. W. Clarke, F.Z.S., made his valuable communication in 1873 (see P. Z. S. 1873, p. 750), and should be called *Otaria hookeri*.

The largest male is nearly equal in bulk to our old male *O. jubata*, but has much shorter front flippers and rather longer external ears.

3. A Blue Penguin (*Eudyptula minor*), from Cook's Straits, New Zealand, presented by Mr. Bernard Lawson, January 26th, being the first example of this interesting little Penguin that has been received by the Society.

The following papers were read:—

1. Report on a Collection of Echinodermata from the Andaman Islands. By F. JEFFREY BELL, M.A., Sec. R.M.S., Professor of Comparative Anatomy and Zoology in King's College, London.

[Received January 18, 1887.]

(Plate XVI.)

Dr. John Anderson, F.R.S., Superintendent of the Indian Museum, Calcutta, was lately kind enough to excite the interest of Col. Cadell, V.C., in the marine zoology of the Andaman Islands, which are at present under his charge, and to present to the British Museum the collections thus made. The following contains a report on the Echinoderms, which Dr. Anderson has asked me to draw up.

The condition in which the specimens reached England reflects great credit on Mr. Booley, who made the collections for Dr. Anderson.

There are in all fifty species of Echinoderms, of which no less than twenty-two are Holothurians; the bulk of what follows will treat chiefly of these interesting but difficult forms, which are abundantly found in the Eastern seas. Of the Asteroids, *Linckia lævigata* was exceedingly abundant, there being twenty examples of it, and one only of *L. pacifica*: of these twenty examples, one was four-rayed. *Scytaster novæ-caledoniæ* was not rare; *Culcita* was represented by handsome species. Of two of the most difficult genera, *Linckia*, *Astropecten*, there is in each case a single example of a form unknown to me; I cannot associate either with a described congeneric form, but, on the other hand, I am not satisfied that they are the representatives of "new species."

Among Ophiuroids, the only noteworthy point is the complete absence of *Ophiothrix* from the present collection. There is but one Crinoid.

It is to be regretted that it is impossible for me to compare the results of a collection at Mergui with that now before me, my report on the Holothurians collected by Dr. Anderson being as yet the only portion of the account of Echinoderms which has appeared in the

Journal of the Linnean Society¹; with the contents of this paper the reports of Prof. Duncan, Dr. H. Carpenter, and Mr. Sladen on the other groups of Mergui Echinoderms should, on their publication, be consulted.

I have tried to arrange the information to be given in the shortest and clearest way possible, giving first a list of the species, then remarks on those to which it is important to direct special attention.

I. CRINOIDEA.

1. *Antedon*, sp.

II. ASTEROIDEA.

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| 2. <i>Acanthaster echinites</i> , E. & S. | 8. <i>Culcita grex</i> , M. Tr. |
| 3. <i>Fromia indica</i> , Perrier. | 9. — <i>schmideliana</i> , Retz. ² |
| 4. — <i>tumida</i> , Bell. | 10. — sp. (" <i>Randasia granulata</i> .") |
| 5. <i>Linckia lævigata</i> , L. | 11. <i>Astropecten polyacanthus</i> , M. Tr. |
| 6. — <i>pacifica</i> , Gray. | 12. — sp. |
| 7. <i>Scytaster novæ-caledoniæ</i> ,
Perrier. | 13. <i>Archaster typicus</i> , M. Tr. |

III. OPHIUROIDEA.

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| 14. <i>Pectinura gorgonia</i> , M. Tr. | 17. <i>Ophiocoma æthiops</i> , Lütken. |
| 15. <i>Ophiolepis annulosa</i> , M. Tr. | 18. <i>Ophiomastix annulosa</i> , M. Tr. |
| 16. <i>Ophiocoma scolopendrina</i> , Lamk. | 19. <i>Ophiarachna incrassata</i> , M. Tr. |

IV. ECHINOIDEA.

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| 20. <i>Phyllacanthus verticillatus</i> , Lamk. | 25. <i>Colobocentrotus atratus</i> , L. |
| 21. <i>Diadema setosum</i> , Gray. | 26. <i>Echinoneus cylostomus</i> , Leske. |
| 22. <i>Astropyga radiata</i> , Leske. | 27. <i>Metalia sternalis</i> , Lamk. |
| 23. <i>Toxopneustes pileolus</i> , Lamk. | 28. <i>Moiria stygia</i> (Lütken, MSS.),
A. Ag. |
| 24. <i>Echinometra lucunter</i> , Leske. | |

V. HOLOTHURIOIDEA.

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| 29. <i>Chirodota rufescens</i> , Brandt. | 38. <i>Holothuria lineata</i> , Ludwig. |
| 30. <i>Haplodactyla andamanensis</i> . | 39. — <i>maculata</i> , Brandt. |
| 31. <i>Pseudocucumis acicula</i> , Semper. | 40. — <i>marmorata</i> , Jäger. |
| 32. <i>Muelleria mauritiana</i> , Q. & G. | 41. — <i>monacaria</i> , Lesson. |
| 33. — <i>miliaris</i> , Q. & G. | 42. — <i>papillata</i> . |
| 34. <i>Holothuria albida</i> . | 43. — <i>vagabunda</i> , Selenka. |
| 35. — <i>atra</i> , Jäger. | 44. <i>Stichopus chloronotus</i> , Brandt. |
| 36. — <i>cadelli</i> . | 45. — <i>variegatus</i> , Semper. |
| 37. — <i>impatiens</i> , Forskal. | |

In addition, there are five specimens belonging to as many species of *Holothuria* as to which I must reserve an opinion till I have, as I hope to have soon, a larger series before me.

CRINOIDEA.

Antedon, sp.

This *Antedon* is represented also in the collection made at Mergui

¹ J. L. S. xxi. p. 25; the whole of vol. xxi. of that Journal will be devoted to the fauna of Mergui.

² Prof. Lovén assures me that I was quite wrong in ascribing to Bruzelius the tract that bears his name (Ann. N. H. (5) ix. p. 166).

by Dr. Anderson; and Dr. Herbert Carpenter, F.R.S., has promised to discuss its relations to *A. palmata* in the report on the Crinoids of Mergui which he has in preparation.

ASTEROIDEA.

ACANTHASTER ECHINITES.

M. de Lorient has lately pointed out¹ that the species of *Acanthaster* found at the island of Mauritius is not, as has been supposed, *A. echinites*; a comparison of his description and Mauritian specimens with the figures of Ellis and Solander and examples from the Andamans will be sufficient to show the student the distinctness of the species.

As the difference has only lately been pointed out, and the confusion cleared up, it is as yet too early to say whether *A. echinites* belongs to the eastern, and *A. mauritiensis* to the western side of the Indian Ocean, or whether their areas of distribution overlap.

FROMIA INDICA.

I have elsewhere² given my reasons for regarding this species, described by Prof. Perrier as six-rayed, as being normally quinqueradiate; a five-rayed specimen in the present collection has R equal to 33, and $r=9$.

With it are two specimens which possibly belong to a different species of the same genus; they are smaller and are still quite spiny.

CULCITA SCHMIDELIANA.

There is a very remarkable specimen which I fancy I am hardly wrong in describing in detail; another is of the more ordinary character.

Almost round; the apices of the ambulacra just touch the equator, so that R is almost exactly equal to r ; the ambulacra narrow rapidly after reaching the actinal periphery. The ordinary arrangement of the adambulacral spines is as follows:—In the innermost row four subequal spines, beside which there may be a fifth smaller; outside of and touching these there may be one large or two smaller spines, and either one or both occupy as much of the side of the groove as do the four spines internal to them; outside of the second there is a third row which is more irregular, especially in the region of the actinostome. All the spines are stout, and more or less rounded at the tip. The interambulacral area, which is thickly covered with flat-headed grains, is almost perfectly triangular in shape; the number of grains in a patch varies; the patches are more closely packed in the middle than at the sides of the interambulacral triangle, and scattered among them are the ordinary granules. Peripherally the patches of grains cease somewhat rapidly; a band, bare of patches, but granular and with sparsely scattered tubercles,

¹ Mém. Soc. Phys. Genève, xxix. no. 4, p. 6.

² Proc. Zool. Soc. 1882, p. 123.

separates them from the poriferous area ; this last extends down to the edge of the actinal surface.

On the abactinal surface there are scattered tubercles and large poriferous patches ; over the whole there is a uniform granulation ; no pedicellariæ were detected.

The madreporic tubercle is large and prominent.

Colour, in spirit, light yellow, the poriferous patches darker.

Measurement round the equator 560 mm. ; height 75 mm. along the longest axis.

The most interesting points with regard to this species are such as bear on its relation to the Echinoidea. Those who accept the old doctrine of Cuvier and Duvernoy, restored in these days by Prof. Haeckel, which explains the constitution of the Echinoderm by the hypothesis that it consists of several fused persons, have found in *Culcita* the form that seemed to show how the free arms of the Starfish might pass into the compact form of the Urchin. This theory of Echinoderm constitution does not recommend itself to me ; and the present species seems to justify the hesitation which one feels in accepting it.

While in flattened or irregular Echinoids there is a tendency for the ambulacra to shorten towards the aboral pole, here the tendency is for the shortening to be towards the mouth. In other words, the most extreme Asterid which we know, though it has a remarkable general resemblance to an Echinoid, is, in its essential morphological points, further from it than is a typical Asterid.

CULCITA GREX.

With a little hesitation I refer a single specimen to this species ; the variability of the forms of the genus *Culcita* is obviously very great, and a careful revision of the species with the aid of a large number of specimens is a pressing necessity. The collection in the National Museum is not yet sufficiently large to justify me in undertaking the task.

CULCITA, sp.

There are two specimens of what would, a short time ago, have been set down as *Randasia granulata*. As, however, M. de Loriol has lately shown, the form so called by the late Dr. Gray is really a young stage of *Culcita*. It will be remembered that Prof. Perrier has expressed himself in a similar sense. Further series are required before the several stages of each species can be accurately defined.

ECHINOIDEA.

DIADEMA SETOSUM.

I am really very doubtful as to the specific identity of two small specimens, the spines of which are banded light and dark, and present the characters of Dr. Gray's "*Calmarius annellata*," with the adult large black-spined forms which are assumed by *D. setosum*. However, I have not sufficient evidence to justify me in attempting to refute the

conclusions formulated by Mr. Alex. Agassiz in his 'synonymy' of this species. The larger specimens collected are magnificent examples of this interesting species.

MOIRA STYGIA. (Plate XVI. figs. 1-3.)

Being in some doubt as to whether I had before me the species described by Dr. Lütken, I sent the drawings here given to that accomplished zoologist with the request that he would compare them with the type in the Copenhagen Museum. Dr. Lütken writes:—"The specimen from Zanzibar is much smaller than your figure [which bore the mark $\times 1\frac{1}{2}$]-24 mm. in length and 14 mm. in height. The anterior lateral ambulacra are more bent, the posterior shorter than in your figure; the posterior excavation of the shell below the periproct less crested than in your figure. But these differences might be those of age." The most striking difference to which this obliging communication directs attention is the great difference in the proportion of height to breadth; however, in a specimen from an unknown locality, which I am inclined to place also in this species, the proportion of height to length is about the same, for it is as 37 to 30, whereas in the Andaman species it is as 33.5 to 27; and the very same is true also of the specimen whose dimensions are given in the 'Revision of the Echini,' where the height is to the long diameter in the ratio of 40 to 49.5.

The other dimensions of the Andaman specimen are:—Breadth 28.5; length of antero-lateral ambulacrum 13; of the postero-lateral ambulacrum 10; length of anal area 4; breadth of do. 3 millim.

It is now for the first time figured, and is the first specimen of the genus that has been shown with the spines on.

The discovery of this species at the Andamans extends its range, though not indeed in any unexpected way; hitherto specimens have been known only from the Red Sea and Zanzibar.

HOLOTHURIOIDEA.

HAPLODACTYLA ANDAMANENSIS. (Plate XVI. fig. 4.)

Body elongated, tapering posteriorly; the skin of a slightly reddish-grey hue, darker above than below.

Tentacles? (retracted).

The body-wall is thin; the ossicles of the œsophageal ring are elongated, rather stout, deeply grooved on the outer surface; the radials are longer than the interradials, and have a bifurcated distal tail. One Polian vesicle. Genital tubes numerous, long, well developed, purple in colour. Lungs extend to anterior end of body, two well but unequally, and one poorly developed lung-trunk; the last does not extend far forwards. Biscuit-shaped or dumbbell-like spicules (Plate XVI. fig. 4).

By the forms of its spicules it is distinguished easily from *H. molpadoides*, and by them and the tapering of the hinder end from *H. australis*.

PSEUDOCUCUMIS ACICULA. (Plate XVI. fig. 5.)

A single specimen of this rather rare species, the spicules of which I have had figured, as their representation seems to be more satisfactory than those of Prof. Semper.

MUELLERIA MILIARIS.

Some of the specimens which I associate under this name differ from *M. lecanora* in that the region of the anus is not lighter than the rest of the dorsal surface; on the other hand, the sharp distinction between the dark brown of the bival and the light colour of the trivial surface is an indication of affinity to *M. lecanora*. Considering the closeness of the resemblances and the slightness of the differences between *M. miliaris* and *M. lecanora*, I feel inclined to suggest that the species should be united. One specimen is of a uniform chocolate-brown colour.

HOLOTHURIA ALBIDA. (Plate XVI. fig. 6.)

Body elongated, tapering somewhat at either end; tentacles darker (? twenty); suckers sparse, scattered. Body-wall thin; œsophageal ring very feeble; Polian vesicle double; lungs poorly developed. The specimen examined had no genital tubes.

The largest specimen was 180 millim. long, had a greatest width of 35 millim., and was 18 millim. wide in the region of the anus.

The flat plates are very irregular in form; the turriform bodies have a single connecting bar, and are knobbed at the narrower end, or where the bar is developed; at the wider end there are also knobs, and these are surrounded by rather coarse spines (Plate XVI. fig. 6).

The position of this species in the keys of Lampert cannot as yet be exactly determined, owing to the retracted condition of the tentacles; it clearly belongs to the group of "*Aspidochirote Formen mit Stühlchen und glatten Schnallen*," and those in which the Schnallen are irregular. Like *H. immobilis*, it has two Polian vesicles; but it differs in colour, in the arrangement of its suckers, and the form of its spicules. Like *H. pardalis*, it has a number of regular plates, but it wants the characteristic marking of that species, and is of much larger size than any known examples.

HOLOTHURIA CADELLI. (Plate XVI. fig. 7.)

Body rounded, tapering posteriorly, dark above, lighter below; prickly papillæ, not so numerous or prominent as in *H. squamifera*, frequently but not always with a white circular base. Body-wall thin.

Tentacles (retracted); œsophageal ring small and inconspicuous, the anterior region so contracted that the disposition of the Polian vesicles cannot be certainly made out. Cuvierian organs in the form of rather numerous stout cæcal tubes from half to one inch in length. Lungs well developed. Genital tubes numerous and extensive.

The flattened spicules are (Plate XVI. fig. 7) of the type of those found in *H. albiventer*, but the knobs are more numerous, and

there are more than three pairs of holes; from that species it is to be at once distinguished by the absence of the remarkably modified turciform spicules. On the whole, it stands nearest to *H. scabra*, but is distinguished by its speckled and less dense integument, and the absence of the median ventral groove. A specimen 160 millim. long has the greatest circumference 40; one 140 millim. is only 10 millim. round at the anus.

Three smaller specimens differ from the more matured, two by a larger amount of orange in their coloration, and the third by the greater stiffness of the skin.

HOLOTHURIA MARMORATA.

I have had great difficulty in coming to a definite conclusion as to the name to be given to the specimens now associated as *H. marmorata*; the complete absence of a circular disposition of the pigmentation prevents their association with *H. argus*; on the other hand, the comparatively small size of the œsophageal ring is against their affinity with *H. marmorata*. I believe the fact of the matter is that Dr. Théel is justified in his supposition that these two species and some others are but varieties or various stages of a variable and widely distributed species which grows to a great size.

HOLOTHURIA PAPILLATA. (Plate XVI. fig. 8.)

Twenty tentacles. Body elongated, may be wider in its hinder than in its two anterior thirds; prominent scattered dorsal papillæ, which are larger and more closely packed anteriorly than posteriorly; five or more small papillæ around the anus.

Suckers on central surface only, arranged in two irregular rows, which unite posteriorly; each sucker is placed on a yellowish papilliform process. Colour dark slate-grey above, lighter below.

Body-wall thin, the parts of the œsophageal ring are small, the ampullæ long; one large Polian vesicle. Genital tubes short and numerous. Apparently no Cuvierian organs. The only calcareous deposits are in the form of stools (Plate XVI. fig. 8).

Notwithstanding these numerous negative characters, the large size and well-developed papillæ must make this a very conspicuous species.

It may be 280, 320 long, and 60, 80 millim. broad.

EXPLANATION OF PLATE XVI.

Figs. 1-3. *Moiria stygia*, $\times 1\frac{1}{2}$.

Fig. 1. With spines, and from the side.

2. Test denuded, to show the arrangement of the plates.

3. Test from above, to show the disposition of the ambulacra.

4. Spicules of *Haplodactyla andamanensis*.

5. Spicule of *Pseudocucumis acicula*.

6. Spicules of *Holothuria albida*.

7. Spicules of *Holothuria cadelli*.

8. Spicules of *Holothuria papillata*.

Figs. 4-8 $\times 500$.